

exhibited at work in the rooms of the Society of Arts. Its action is based on the fact that air, not being a 'perfect gas,' is reduced in temperature when suddenly allowed to expand through a narrow orifice from a high to a low pressure. The slight cooling effect thus obtained is rendered cumulative by the cooled air being used to abstract heat from the air that has not yet passed the orifice. Each successive portion of air is, therefore, cooler when it reaches the orifice than was its predecessor, and thus in time so low a temperature is reached, provided due precautions are taken to insure thermal isolation, that a change of state occurs and air appears in the form of liquid. The particular machine on view circulates each hour about 15 cubic mètres of air, which is expanded from a pressure of 200 atmospheres to one of 16, and produces about 1.9 litres of liquid air an hour with a continuous expenditure of three-horse power. Although the oxygen and nitrogen of the atmosphere liquefy simultaneously, still the latter evaporates more quickly, and this fact can be utilized to obtain a liquid which is very rich in oxygen. An interesting application of liquid air containing 40 or 50 per cent. of oxygen has recently been made. Mixed with powdered charcoal it forms an explosive which is comparable in power to dynamite, and which, like dynamite, can be made to go off violently by using a detonator. Trials which have been carried out with this material in a coal mine at Penzburg, near Munich, are claimed to have given very satisfactory results. The explosive is cheap, its cost being practically that of liquefying air; but, of course, owing to evaporation, it is only capable of exploding for a few minutes after being mixed.

UNIVERSITY AND EDUCATIONAL NEWS.

PRESIDENT DWIGHT, of Yale University, has published his annual report. He suggests suitable gifts to the University amounting in value to over \$3,000,000, which he hopes may be secured in celebration of the coming bi-centennial. The value of the Lampson bequest is stated to be upwards of \$400,000. President Dwight especially dwells on the need of a building for the work in physiological chemistry, the need of

\$150,000, which, with the existing fund of \$100,000, will make possible the completion of the Peabody Museum and the desirability of enlarging the observatory. The library acquired by purchase during the year 7,840 volumes and by gift 1,385 volumes, and the pamphlets added to the library were 6,300 in number. During the past ten years the teaching force of the University has increased from 43 to 102.

THE Board of Overseers of Harvard College have adopted the following resolution:

Resolved, That the overseers will see with pleasure the admission requirements of the Lawrence Scientific School brought as rapidly as circumstance may permit to substantial equality with those of Harvard College, provided that, in so doing, the standard for admission to the Scientific School shall be steadily raised, and that for admission to the College in nowise lowered.

THE New York State Department of Public Instruction has decided to hold four summer schools this year for the teachers of the State. The past two years two schools have been held, at Chautauqua and Thousand Islands Park. The two additional schools will be held at Greenport, Long Island, and Ithaca.

THE West Virginia University has established eleven fellowships yielding \$300 yearly and free tuition. The fellows are expected to teach one hour a week or give two hours' supervision in the laboratory. In the eleven subjects for which the fellowships are awarded, the sciences are well represented, they being as follows: Chemistry, Physics, Geology, Zoology, Botany, Mathematics, Mechanical Engineering, Civil Engineering, Economics, English and Greek.

THE estate of Mrs. Julia W. James, of Boston, divided by her will between the Museum of Fine Arts and the Massachusetts Institute of Technology amounts to over \$500,000.

AT Harvard University Mr. S. I. Bailey has been promoted to an associate professorship of astronomy and Dr. W. T. Porter to an associate professorship of physiology.

DR. NORMAN WILDE, assistant in philosophy in Columbia University, has been appointed instructor in philosophy in the University of Minnesota.

THE John Tyndall Fellowship of Columbia

University for the encouragement of research in physics has been awarded to R. B. Owen, a graduate of the School of Engineering and professor of engineering in the University of Nebraska. Of the twenty-four fellowships annually awarded, the following fall more immediately within the field covered by this JOURNAL: T. E. Hazen, botany; B. H. Owen, philosophy; J. D. Irving, geology; E. Kasner, mathematics; W. C. Kretz, astronomy; J. W. Miller, Jr., mechanics; F. C. Paulmier, zoology; F. J. Pope, chemistry; C. E. Prevey, statistics; R. S. Woodworth, psychology.

HERR KRUPP has given 20,000 M. to the Institute of Physical Chemistry at Göttingen.

A COMMISSION of ten members of the Paris Municipal Council has been appointed to study the relations between the city and the University.

SOMETIME since we called attention to the decree excluding foreigners from the engineering departments of the Berlin School of Technology. The *Scientific American* quotes some German opinions of the subject. Thus the *Deutsche Zeitung* remarks: "At the non-Prussian high schools at Munich, Dresden, Stuttgart, Karlsruhe, Darmstadt and Brunswick there are 1,200 foreigners out of 8,682 students. We hope that, as the foreigners use their knowledge to the detriment of German industry, the non-Prussian governments will forthwith exclude them." It is learned that for some time past there has been an exchange of views between Prussia and the other German governments on this subject, and there is no telling how soon the policy may become general throughout Germany. The following expression by a high German official indicates the feeling on the subject: "There is no question that the German technological schools and industrial and scientific institutions will soon be forced to adopt a less liberal policy with foreigners. The tricks of trade we have been teaching them so long are now being used against us to the great injury of our industry."

DISCUSSION AND CORRESPONDENCE.

COLOR VISION.

IN a paper upon Color Vision, published in SCIENCE, April 15, 1898, Professor W. Le Conte

Stevens deplores the unsettled state of psychological opinion on matters of visual theory. "The bewildered physicist * * * * desparingly beseeches the psychologists to agree among themselves, but they will not agree; on the contrary, the prospect seems to be that additional color hypotheses will continue to appear until from their abundance they cease to receive attention." In the present article I hope to be able to show that the psychology of Color Vision is not quite so chaotic as to Professor Stevens it seems to be.

First of all, however, I desire to express my appreciation of the courtesy and frankness with which the author's challenge to the psychologists is made. The work of scientific men to-day is very highly specialized, and it taxes one's energies to the utmost to keep abreast of the movement of thought in one's own special province. Nevertheless, we are all, to some extent and in certain cases, dependent upon our neighbors; we must at times make excursions into adjacent scientific fields. Here, then, is a great difficulty. If we stay at home we fail of knowing something that we ought to know; if we travel into another domain we are apt to go astray. We have no perspective in the unfamiliar science; we cannot distinguish the important from the unimportant; our reading of the literature has been intermittent and perfunctory. However earnest our attempt to find out what is doing next door, its result must oftentimes be a personal bewilderment and confusion, which we may very easily make objective and ascribe to what is in reality a perfectly orderly household. I have sometimes left the study of a disputed point in nerve physiology with the feeling that the whole issue was a matter of the merest conjecture; but a subsequent talk with a working neurologist has given me a scale of values, and indicated definitely enough to which side the balance of probability inclined.

Professor Stevens, writing as a physicist, gives up the psychological problem of Color Vision, and calls upon the psychologists to settle the question for him. We cannot quite do that, because Color Vision is, and will for some time remain, debatable ground. But we can, returning his candid appeal an equally candid answer, give him the clue to the maze of hypothesis, or,